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DEMOCRACY AS A CURVE

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Abstract

This paper attempts to model the widely studied relationship between a country's economic growth and its level of democracy, with an emphasis on possible non-linearities. We adopt the concept of "political capital" as a measure of democracy, which is extremely uncommon in the literature and brings considerable advantages both in terms of dynamic considerations and plausibility. While the literature is not consensual on this matter, we obtain significant and robust results that indicate that the impact of democratization on economic growth varies according to the stage of democratic development each country is in.

Keywords

Democracy, Economic Growth, Political Capital, Political Economy

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I. Introduction

The concept of democracy is present across various dimensions of our civilization. The institution and maintenance of democracy is one of the most defining plights of human society in the last centuries, and a democratic way of rule is widely culturally regarded as a value in itself. This is arguably mostly based on the value of equity, which is a main objective of democracy. In economic terms, we could argue that it is an expression of the efficiency-equity trade-off – one may suggest that centralization might bring about efficiency gains[1], but it is most certainly equity reducing.

Looking at the literature, however, one finds no clear consensus on whether democracy increases or decreases economic performance. Assessing it objectively is made difficult for two reasons: firstly, evaluating how democratic a country is will always be at least somewhat subjective; secondly, one would expect the impact of democratization on economic performance to depend on a country's level of democratization itself, since a dictatorship's first steps into democracy and the improvement of an already democratic way of rule are unquestionably different processes. This dynamic component has, as far as we are aware, been largely ignored in the existing literature.

This paper will attempt to shed some light on this matter – to establish the economic performance of a country as a function of its level of democratization, modeling the relationship as a curve and allowing for inflexion points.

The use of a broad database encompassing more than 60 countries over several years (approximately 2400 observations) means that we are not studying specific countries, but modern society and its democracies – empowered by an extensive dataset, we attempt to better understand how economy and democracy relate.

[1] This and other views are discussed in section II.

This paper is organized as follows: section II provides an overview of the existing literature on this matter. Section III theoretically discusses the novelty of our approach. Section IV describes the data we use, while section V presents and explains the model. Section VI details obtained results. Section VII contains robustness checks to our results. Finally, section VIII concludes.

II. Literature review

The literature on the impact of democracy on economic growth or income, henceforth referred to as economic performance, is extensive – the conclusions, however, are not consensual. The existing research is divided between those who find that democratization decreases economic performance (Barro, 1996; Tavares and Wacziarg, 2001), those that find that it increases economic performance (Gerring et al., 2005; Acemoglu et al., 2014; Knutsen, 2015; Madsen et al., 2015) and those that find that it has had no significant impact (Helliwell, 1994).

The avenues through which democratization could impact economic performance have, similarly, been the topic of a large branch of literature. Increased human capital accumulation (Tavares and Wacziarg, 2001; Corujo and Simões, 2012; Acemoglu et al., 2014), lower income inequality (Tavares and Wacziarg, 2001), better protection of property rights (Leblang, 1996; Clague et al., 2003; Knutsen, 2011), the fostering of technological growth (Coccia, 2010), the elimination of the risk of "predatory rulers" (Krieckhaus, 2006; Knutsen, 2012), openness to non-elites and the institutional flexibility that democracy implies (Acemoglu, 2008; Davis, 2010) and finally the encouragement of investment, economic reforms, better public good provision and reduced social unrest (Acemoglu et al., 2014) are the main reasons found for a positive relationship. On the other hand, reduced physical capital accumulation and higher government consumption in relation to GDP (Tavares and Wacziarg, 2001), increased vulnerability to interest groups and lobbies (Olson, 1982; Wade, 1990; Doucouliagos and Ulubaşoğlu, 2006), higher vulnerability to growth-stifling populism (Doucouliagos and Ulubaşoğlu, 2006;

Krieckhaus, 2006) and the wealth redistribution from rich to poor that democracies tend to enact (Barro, 1996) are some of the factors that suggest that democratization may reduce growth.

Finally, some studies with a dichotomous emphasis (autocracy vs. democracy) offer interesting, more specific insight on the matter at hand. De Luca et al. (2015), building on Olson (1993), show how an own-wealth maximizing capital-rich dictator may generate higher growth than what would occur in a democracy. On this same issue, Doucouliagos and Ulubaşoğlu (2006) argue that an autocracy could be superior to a democracy in terms of growth due to myopic voting behavior – in a democracy, voters may prefer higher consumption today at the expense of investment, which would bring about future welfare gains. Madsen et al. (2015), using a very broad database (from 1500 to 2000), reach the conclusion that democracy did positively impact income growth in their sample. Acemoglu et al. (2014) also make a very compelling argument for a positive relationship ("Democracy does cause growth"), which is in line with the recent academic tendency.

Since the construction of a variable that measures the level of democratization of each country for a long time period seems a quite technical and daunting enterprise, papers such as this one must either rely on existing variables for this purpose or face the challenge of creating a new one. The literature offers several options – for this investigation, we have considered the Polity IV project (Marshal et al., 2016), Tatu Vanhanen's Polyarchy Index (Vanhanen, 2002), The Democracy Ranking Association's Democracy Ranking (Campbell, 2008), the Unified Democracy Scores (UDS) (Pemstein et al., 2010) and the Latent Democracy Variable (LDV) (Foldvari, 2014). The first two are the most widely used and accepted ones. The Polyarchy Index is the simplest, factoring political competition and participation equally as a measure of democracy. Polity IV's *polity2* variable offers, in our view, several advantages relatively to Vanhanen's data: it takes more factors into account (such as constraints on the executive, for example) and allows us to distinguish between democracies (positive values) and autocracies

(negative values). Additionally, according to Pemstein et al. (2010), the Polity IV project offers one of the top three higher reliabilities among existing democracy scales, while Vanhanen's measure often differs significantly from other scores. Further reading into Pemstein et al., however, allows us to identify some caveats with Polity IV's data – notably, that the mid-section of the ranking may be significantly overlapping (small differences in this range seem, as such, potentially arbitrary). Treier and Jackman (2008) also discuss the issues with this index at length, stressing the information loss that occurs in the aggregation of each partial score (so that quite different regimes may be evaluated in the same way if their scores add up the same), the arbitrary aggregation method and the presence of a measurement error within the variable (which is usually overlooked when the index is applied in research). While we recognize its strengths, we take these criticisms into account and therefore approach this variable with care.

The Democracy Ranking is the most particular measure we have found – it uses not only political, but also economic and development indicators to build a "complete" measure of democracy – democracy as societal evolution. While we regard the concept as quite interesting and have considered using the ranking for our analysis, ultimately its small scope (little more than 10 years), lack of presence in the literature and potential for endogeneity have made us opt for different measures.

Treier and Jackman (2008) stress that democracy is a latent variable – it is not directly observed, but rather has to be constructed from observed or theorized measures. A possible way to curb this issue is to use a variable such as the LDV or UDS – measures extracted from several existing indexes of democratization with the goal of minimizing measurement errors. Since LDV is extracted only from the Polity IV and Polyarchy Index scales and UDS, conversely, takes 8 more existing measures into account (and both cover our 1960-2010 timeframe equally), the Unified Democracy Scores seem a more attractive option. Pemstein et al. (2010), in order to construct the UDS, use a Bayesian approach, which means, they argue, that "for every country-

year, [our variable] is at least as reliable as the most reliable component measure". Like the *polity2* variable, the UDS are also presented in a scale that encompasses positive and negative values.

From our survey of the available democracy measures, we find two variables that seem adequate for our estimation: Polity IV project's *polity2* due to its wide acceptance in the literature[2] and the UDS by Pemstein et al. due to its tackling of all major issues we find with the former index.

As has been mentioned before, our aim is to investigate the existence of a non-linear relationship between economic growth and democratization. This has been studied in a small fraction of the literature – specifically, Barro (1996) finds significance for an inverted-U-shaped relationship (there is a level of democracy that maximizes growth), using a database of 100 countries from 1960 to 1990. We regard these conclusions as the basis of our study and intend to augment it via a longer timeframe, the possibility of more than one inflexion point and the use of different political data (notably, the use of a political capital variable). Alfano and Baraldi (2016) have found the same relationship using data for political competition on 83 countries from 1979 to 2011. While we expect to back their results, we believe political competition to be an insufficient measure to effectively characterize a country's political system.

III. Theoretical discussion

As we have attempted to show with section II, the literature on the democracy/growth relationship is extensive. We find, however, that estimations almost invariably take the form of a regression or series of regressions using growth as the dependent variable and a lagged variable that measures how democratic a country was in a specific year as the main independent variable. This framework, in our opinion, presents two major caveats:

[2] Gerring et al. (2005), Coccia (2010), Corujo and Simões (2012), Murtin and Wacziarg (2014), Madsen et al. (2015) and Alfano and Baraldi (2016) are some examples from our literature that rely on Polity IV Project variables.

a) The use of a political measure for a specific year only (a "democracy flow");

b) The assumption that the relationship should be linear.

Regarding a), the use of a lagged democracy flow ignores all previous democratic history, since a just democratized country's positive political index score and the score of a long-running democracy are viewed by the model as the same. This seems overly simplistic – we will, as such, attempt to use the more realistic formulation of a political stock: the accumulation of democratic governance throughout the years. In our robustness section, we turn to the democracy flow method to allow for comparisons.

Caveat b) is, in our opinion, equally as relevant – it gains, however, increased weight when we model democracy as a stock rather than a flow. When we assume linearity, we are effectively saying that a change in the level of democratization of a country will have the same impact on economic growth, regardless of how democratic society was to start with. It is not difficult to argue against this view – the many, potentially opposing effects detailed in section II could very plausibly have different weights depending on the level of democratic evolution. Take, for instance, the increased openness to non-elites that should increase growth when a country becomes more democratic – a quite democratic country should have already taken measures with such an objective in the past. As such, increased growth via this avenue should, from a certain point onwards, cease to become substantial. Arguments such as this make it seem quite plausible that there is a certain stock that maximizes growth – countries beyond that could, for various reasons detailed in section II, sacrifice growth for other goals or simply stifle it.

To address a), we follow Gerring et al. (2005) and their political stock concept – the construction of the stock variable will be detailed in section V. In regards to b), we adopt a model that includes political stock as its main independent variable as well as political stock to the power of 2 to 6, so as to attempt to identify any existing non-linearities. The number of inflexion points is mostly a theoretical assumption – Barro (1996) and Alfano, Baraldi (2016) have found

significance for a quadratic formulation, but we find it plausible that at least a second inflexion point occurs, especially since our scale encompasses both the level of autocracy (negative values) and democracy (positive values), and these may relate to growth differently.

IV. Data

The *polity2*[3] variable from the Polity IV project endows us, before treatment, with 215 years (1800-2015) of data on more than 150 countries – this makes it a quite powerful instrument. The Unified Democracy Scores[4], on the other hand, cover the 1946-2012 timeframe for more than 110 countries.

For economic and demographic data, we have used both World Bank's and Clio-Infra project's online databases[5]. These have effectively reduced our database to the years of 1960-2010, and as such nullified the longer timeframe advantage of *polity2*.

After treatment (in order to eliminate missing values of economic growth and political indexes), we work with a yearly database of 51 years and 66 countries, amounting to 3366 observations. Our choice of controls follows a simple method: we survey the literature for controls in growth regressions and choose those that fit our purpose and do not display a non-stationary behavior. They are the following:

- Electric power consumption in KWh per capita as a proxy for GDP per capita[6];
- Natural logarithm of population growth (Mauro, 1995; Alfano and Baraldi, 2016);

[3] For details on the construction of this variable, refer to Marshal et al. (2016). Data originate from http://www.systemicpeace.org/inscrdata.html.

[4] For details on the construction of this variable, refer to Pemstein et al. (2010). Data originate from http://www.unified-democracy-scores.org/uds.html. Missing UDS values for Jamaica have been obtained from the Clio-Infra project's database (https://www.clio-infra.eu/).

[5] Specifically, electric power consumption, GDP, population and trade data have been obtained from the World Bank (http://data.worldbank.org/indicator) and inflation from Clio-Infra (https://www.clio-infra.eu/).

[6] We have not found any other paper using this proxy, but GDP per capita or income (which display a unit root in our data) are widely used (for example, Helliwell, 1994; Barro, 1996; Gerring et al., 2005 and Coccia, 2010). The value of electric consumption was, out of the variables we considered, the only one not to display a non-stationary behaviour – hence our choice. It further displays a correlation of 0.8112 with GDP per capita, therefore appearing to be a good proxy.

- International trade (imports+exports) as a percentage of GDP (Gerring et al., 2005; Acemoglu et al., 2014);
- Inflation rate (Gerring et al., 2005).

With these, we believe we strike the right balance between covering the main dimensions that impact growth and parsimony. We purposely leave several common controls, such as human capital, unaccounted for – we want all indirect avenues through which democracy impacts growth to be included in our democracy variable's impact[7].

Electric power consumption is intended as a proxy for GDP per capita. It represents the convergence theory – poorer countries tend to grow faster than rich ones, so that eventually income levels should converge. Population growth, which could also be measured with fertility rates, represents the idea that an economy will grow less if more resources are affected to childbearing and extra capital is required to equip the new generations (whilst, with lower population growth, capital per worker would grow more with investment). This is in line with Barro (1996). International trade, on the other hand, is meant to measure trade openness, which seems an important factor for economic growth and is not necessarily a characteristic of democratic or autocratic societies. Tavares and Wacziarg (2001) discuss how protectionism may occur both in democracies and autocracies, as agents who benefit from protection can generally mobilize more easily than the remaining population regardless of the regime. Finally, Barro (1995) has established a negative relationship between inflation and growth – we control, as such, for the change in the general price level of the economy. This is again based in the notion that inflation may affect countries regardless of their democratic development, especially when it is due to international events, such as, for example, an oil shock.

The differing distributions of missing values along our control variables have brought upon us the choice of either using an unbalanced panel or severely limiting the number of observations in

[7] Gerring et al. (2005) do this to an even greater extent by using only GDP per capita as a control – this, in our opinion, risks being overly simplistic.

our study. We have opted for the former, in line with a significant part of our literature (such as Acemoglu et al., 2014 or Madsen et al., 2015). The elimination of missing values brings our database to its final version, with 2406 observations.

Below, we present a series of tables. Table 1 displays descriptive statistics for our used variables. Table 2 reports the unit root test results, while table 3 displays the variance-covariance matrix between our variables. Appendix A1 further presents a list of used countries, as well as their respective *polity2* and *UDS* scores in 1960 and 2010 – it shows that our sample is not only adequately diverse geographically, but also in terms of democratic starting and finishing "positions". It further gives us some insight on the similarities and differences between *polity2* and *UDS*[8].

Table 1. Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
GDP growth	3300	.020616	.0429822	-0.3086214	0.5704207
Electric consumption	2739	3352.337	4169.772	14.68682	25590.69
Population growth	3150	12.26891	1.63813	2.079442	16.94183
Trade openness	3149	55.51591	29.7706	4.920835	220.4073
Inflation	3162	38.27432	514.3589	-20.07576	23773.13
polity2	3366	3.116756	7.470499	-10	10
UDS	3366	0.3376526	1.043991	-2.112144	2.262576

Table 2. Results for the Im-Pesaran-Shin unit-root tests[9]

Variable	p-value (demeaned)
GDP growth	0.0000
Electric consumption	0.0899
Population growth	0.0000
Trade openness	0.0915
Inflation	0.0000
polity2	1.0000
UDS	0.0000

Table 2 presents a surprising finding – the *polity2* variable appears to be non-stationary. This could impair inference from regressions that use this measure. Nonetheless, since we intend on

[8] Only 8 out of the 132 presented cases differ in sign – we therefore believe it to be acceptable to interpret the sign of the *UDS* variable in the same way as *polity2*'s (positive values for democracy, negative for autocracy).
[9] Null hypothesis: some panels contain unit roots. All variables but *polity2* appear to be stationary considering a significance level of 10%.

building a political capital variable, this will not necessarily be an issue, as long as our constructed variable is stationary. This issue does not affect the *UDS*, as the table further shows.

Table 3. Variance co-variance matrix

	GDP growth	***Electric consumption***	***Population growth***	***Trade openness***	***Inflation***	***polity2***	***uds***
GDP growth	1						
Electric consumption	-0.0066	1					
Population growth	0.0190	-0.3478	1				
Trade openness	0.0352	0.1326	-0.3898	1			
Inflation	-0.1309	-0.0456	0.0420	-0.0510	1		
polity2	0.0228	0.4409	-0.3301	0.0721	-0.0101	1	
UDS	0.0307	0.6039	-0.4719	0.1233	-0.0389	0.9115	1

From table 3, it is difficult not to take special notice of the very high correlation between *polity2* and *UDS* – this should be a good sign, since they are meant to measure the same phenomenon. Conclusions must be taken with care, however, since *polity2*'s non-stationarity could mean that this correlation is spurious.

V. Methodology

According to the discussion in section III, we chose to follow Gerring et al. (2005) by using a measure of "political stock" – henceforth defined as political capital (or *pk*) – as our indicator for democracy. This variable is constructed as a stock of all "flows of democracy" (the *polity2* and *UDS* variables) up till time *t*, with a 1% yearly depreciation[10]. Since political capital depreciation is a somewhat novel concept, the way we postulate it leaves room for discussion. We identify three possibilities:

a) No depreciation (*pk0*);

b) Depreciation towards 0 (*pk1*) ("neutral", neither democratic nor autocratic);

c) Depreciation towards -10 (*pk2*).

The three possibilities are detailed in table 4.

[10] Gerring et al. (2005) test depreciations of 1%, 5% and 10% and conclude the first one to be the most adequate. This paper will, as such, also use 1%.

Table 4. Descriptive statistics for pk0, pk1 and pk2

Variable	Observations	Mean	Std. Dev.	Min	Max
$pk0_{polity2}$	3366	49.32828	202.7599	-510	510
$pk1_{polity2}$	3366	43.9695	169.2325	-401.044	401.044
$pk2_{polity2}$	3366	21.41633	198.2666	-661.0781	401.044
$pk0_{UDS}$	3366	4.782056	28.98522	-86.39919	98.85053
$pk1_{UDS}$	3366	4.346451	24.27387	-67.74898	78.53762
$pk2_{UDS}$	3366	1.080396	28.19844	-112.4154	78.53762

For us to choose a), we would be assuming that a democracy flow would have the same impact on all subsequent years. This does not seem a very realistic postulation – it makes sense that the impact of an occurrence that increases the level of democracy subsides across time (democracy requires sustained efforts). As such, we cast *pk0* aside.

pk1 assumes that both democracies and dictatorships tend to converge to a "grey zone" – neither democratic nor autocratic. *pk2*, on the other hand, assumes that any regime tends do degenerate towards autocracy. The main difference between the two is the conceptualization of democracy: while *pk1* reveals the vision that dictatorship and democracy are different articles that both tend to subside if not "renewed" (towards each other, due to the nature of our variable), *pk2* rather formulates dictatorship as the absence of democracy – depreciation, as such, is always negative. Democratization (anti-autocratization) efforts are lost along time if not renewed. While we have found it hard to choose between these two indicators, there is an obvious mathematical advantage to *pk1* – it converges to zero, while *pk2* may decrease infinitely if a given country accumulates too much negative political capital. This is not a very realistic situation – we would effectively be condemning a country under a long dictatorship to ever-decreasing political capital. Due to this and to the fact that Gerring et al. seem to follow the *pk1* scheme[11], we choose this option as well (henceforth referred to simply as *pk*). Im-Pesaran-Shin unit root tests to both the pk1 variables reject the null hypothesis of the existence of unit roots[12].

We construct, as such, our political capital variable in the following manner:

[11] It is not made absolutely clear.

[12] When demeaned, p-values are 0.0000 for both *polity2* and *UDS*. $pk1_{polity2}$ and $pk1_{UDS}$ display a correlation of 0.9559, suggesting that the relationship between *polity2* and *UDS* found in table 3 was, in fact, not spurious.

$$pk_{i,t} = 0.99 * pk_{i,t-1} + pf_{i,t} \quad (I)$$

where $pk_{i,t}$ is the stock of political capital of country *i* at time *t* and $pf_{i,t}$ is the political flow of country *i* at time *t*[13].

Since our data start in 1960, our political capital accumulation begins in this year. Using a broader timeframe (Gerring et al. start in 1900, although this choice is arbitrary) would imply making assumptions on missing values of the flow variables, which could compromise our estimation's validity – we chose, as such, to stick with data that was entirely available.

It is worthy of notice how novel this approach is – other than Gerring et al., the concept political capital has, as far as we could find, only been used by Persson and Tabellini (2006), who follow a similar postulation, augmented with neighboring political effects.

As for the estimation itself, we follow a simple two-step process. Firstly, due to the structure of our data (higher number of countries than number of years) and the presence of a lag of the dependent variable on the right-hand side of the regression, we use the Arellano-Bond estimator (Arellano and Bond, 1991), in line with literature such as Acemoglu et al. (2014), to run a regression with our dependent variable, economic growth, and all controls:

$$growth_{i,t} = \alpha + \beta growth_{i,t-1} + \gamma \mathrm{X}_{i,t} + TD_t + \varepsilon_{i,t} \quad (II)$$

where α is an intercept term, $growth_{i,t}$ is the GDP growth of country i at time t, $\mathrm{X}_{i,t}$ is a vector of controls for country *i* at time *t*, TD_t is a full set of year dummies and $\varepsilon_{i,t}$ are the residuals. This error term represents "controlled" growth – since our objective is to build a graph that relates growth to political capital, we then use the estimated residuals from *(II)* to perform a second

[13] Note that $pk_{i,1960} = pf_{i,1960}$.

estimation, this time via OLS with fixed country effects and clustered standard errors, so as to avoid concerns with heteroskedasticity:

$$\hat{\varepsilon}_{i,t} = \alpha + \beta pk_{i,t-1} + \gamma pk_{i,t-1}^2 + \eta pk_{i,t-1}^3 + \theta pk_{i,t-1}^4 + \phi pk_{i,t-1}^5 + \psi pk_{i,t-1}^6 + u_{i,t} \quad (III)$$

where $u_{i,t}$ is the error term. With the inclusion of the *pk* term to the power of 1 to 6[14], we aim to make sure that we do not miss any non-linearity. We intend on performing various estimations of *(III)* with an increasing number of exponential terms, in order to evaluate which is the most adequate. In line with Gerring et al. and the general literature, we use political capital with a one-year lag. Finally, from *(III)* we predict $\hat{\varepsilon}_{i,t}$ and plot it against $pk_{i,t-1}$, so as to obtain our curve. The idea behind the separation of regressions *(II)* and *(III)* is to obtain a final function in only two variables, in order to facilitate graphical depiction.

VI. Results

We begin this section by running and comparing several specifications, so as to ascertain which one is the most adequate. We are aware that our method assumes orthogonality between the political capital variables and all controls, effectively meaning that our estimated curves may not be entirely precise. For this reason, the specification tests are made with a "complete" equation *(II)*, to which we add the political capital variables. Tables 5 and 6 present estimation results for this model with the various possible numbers of exponential terms.

[14] In order for these terms to function properly, we first modify the political capital variables to make them range between positive values only.

Table 5. Specification tests for *polity2* (dependent variable: $GDP\ growth_t$)

Covariates	(1)	(2)	(3)	(4)	(5)
$pk_{polity2_{t-1}}$	0.010	-0.020	-0.002	-0.179***	-0.142*
$pk^2_{polity2_{t-1}}$	-0.001	0.001	-0.001	0.001***	0.001
$pk^3_{polity2_{t-1}}$	-	-0.001	0.001	-0.001***	-0.001
$pk^4_{polity2_{t-1}}$	-	-	-0.001	0.001***	0.001
$pk^5_{polity2_{t-1}}$	-	-	-	-0.001***	0.001
$pk^6_{polity2_{t-1}}$	-	-	-	-	-0.001
$GDP\ growth_{t-1}$	20.239***	19.950***	19.855***	18.101***	18.073***
$Electric\ consumption_t$	-0.001***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
$Population\ growth_t$	-0.532**	-0.437*	-0.409*	-0.491**	-0.479**
$Trade\ openness_t$	0.016	0.017*	0.018*	0.017*	0.018*
$Inflation_t$	-0.001*	-0.001**	-0.001**	-0.001*	-0.001*

Notes: this table reports estimates of the effect of each independent variable on GDP growth for the Arellano-Bond estimation of each model. Coefficients are multiplied by 100 and rounded to 3 decimal places. All estimations contain a full set of year dummies (omitted in this table). Number of observations: 2302. * denotes significance at a 10% level, ** at a 5% level and *** at a 1% level. Tests for autocorrelation of order 2, 4 and 5 show no evidence of autocorrelation. There is evidence for autocorrelation of order 3 at a 10% confidence level, meaning that our estimated standard errors may be biased downwards. To curb this issue, robust standard errors are employed.

Table 6. Specification tests for *UDS* (dependent variable: $GDP\ growth_t$)

Covariates	(6)	(7)	(8)	(9)	(10)
$pk_{UDS_{t-1}}$	0.010	-0.258***	-0.236*	-0.417***	-0.570*
$pk^2_{UDS_{t-1}}$	-0.001	0.004***	0.003	0.012	0.022
$pk^3_{UDS_{t-1}}$	-	-0.001***	-0.001	-0.001	-0.001
$pk^4_{UDS_{t-1}}$	-	-	-0.001	0.001	0.001
$pk^5_{UDS_{t-1}}$	-	-	-	-0.001	-0.001
$pk^6_{UDS_{t-1}}$	-	-	-	-	0.001
$GDP\ growth_{t-1}$	20.280***	19.847***	19.842***	19.856***	19.849***
$Electric\ consumption_t$	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
$Population\ growth_t$	-0.531**	-0.455*	-0.452*	-0.490**	-0.486**
$Trade\ openness_t$	0.016*	0.018*	0.018*	0.018*	0.018*
$Inflation_t$	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**

Notes: this table reports estimates of the effect of each independent variable on GDP growth for the Arellano-Bond estimation of each model. Coefficients are multiplied by 100 and rounded to 3 decimal places. All estimations contain a full set of year dummies (omitted in this table). Number of observations: 2302. * denotes significance at a 10% level, ** at a 5% level and *** at a 1% level. Tests for autocorrelation of order 2, 4 and 5 show no evidence of autocorrelation. There is evidence for autocorrelation of order 3 at a 10% confidence level, meaning that our estimated standard errors may be biased downwards. To curb this issue, robust standard errors are employed.

Firstly, all but one instance of our used control variables display statistical significance, and additionally they also present very similar estimated coefficients in all formulations (both for *polity2* and *UDS*). All signs are what we would expect: positive for the lag of *GDP growth*, indicating some persistence; negative for *electric consumption*, in accordance with the theory of convergence; negative for *population growth,* representing the trade-off we theorized in section

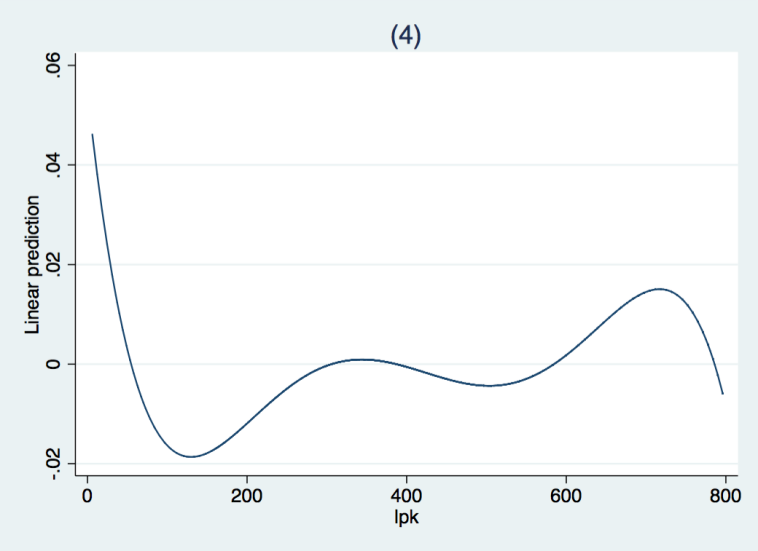
IV; positive for *trade openness*, emphasizing the positive effects of trade on growth and finally negative for *inflation*, in line with Barro (1995).

Table 5 shows estimation results for the various possible specifications using the *polity2* variable. We find extremely high significance for specification (4), and basically no significance for all other ones – it is, hence, quite easy to choose between them. We find, with these results, our first concrete evidence that the relationship between democratic evolution in a society and its economic growth should not be linear – the *polity2* variable predicts the existence of four inflexion points.

Table 6, on the other hand, displays results for the same specifications, using the *UDS* variable. We again find full (and quite high) significance for only one specification – this dataset predicts that (7) is the most adequate postulation, meaning 2 inflexion points. With this result, we add robustness to our recent non-linearity conclusion. It is worthy of note that the inverted-U-shaped relationship that some literature has found does not seem to occur with a political capital variable.

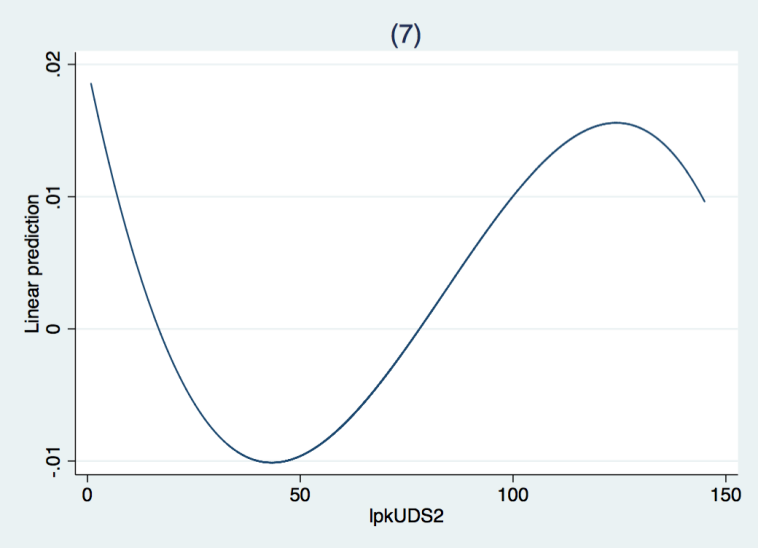
The next step lies in the estimation of the actual curves, using the two-step process described in section V. We omit the estimation results, since they should be less precise than the ones presented. Below, we present the curves that correspond to specifications (4) (table 5) and (7) (table 6), since these are the ones that display full significance. In appendix A2, all remaining curves are presented, showing the sensitivity of the curve's shape to differences in specification – the *UDS* ones display high consistency, while the *polity2* curves are somewhat more diverse in appearance between themselves.

Figure 1. Graphical depiction of specification (4)



Notes: the y-axis measures the predicted residuals from equation *(II)*, while the x-axis measures the stock of political capital (built with the *polity2* variable).

Figure 2. Graphical depiction of specification (7)



Notes: the y-axis measures the predicted residuals from equation *(II)*, while the x-axis measures the stock of political capital (built with the *UDS* variable).

Prior to any interpretation, it is useful to recall that the y-axis values are predicted residuals – as such, a negative value does not necessarily imply negative GDP growth (simply lower than what was predicted when using our controls only as independent variables).

Both figure 1 and 2 add weight to the argument that the relationship we want to model is non-linear. Actually, they are quite similar in broad terms and implications – they both imply that maximum growth is attained with minimum democracy stock and that there is a "democracy maximum", a point that corresponds to a quite high level of political capital that maximizes growth. Two main facts are worthy of notice about this point – firstly, it implies lower growth than the total dictatorship point; secondly, it does not occur for the maximum observed value of political capital. This not only backs the literature that argues that dictatorships may be growth maximizing ("Growth-friendly dictatorships", De Luca et al., 2015), it also says that democratization does not always mean increased economic growth – from a certain point onwards, when a society furthers its democratization process, it is sacrificing some growth. Eventually, democracy becomes a "good-to-have". If we assume agents know this relationship[15], it means that, at least from the democracy maximum onwards, people value their welfare above economic growth.

While not as blatant as their similarities, these curves also display a few differences. The most striking one is probably optimism – the *UDS* curve is expressively more optimistic on how close the democracy maximum is to total dictatorship in terms of growth. Actually, it is nearly the same, while *polity2* predicts less than half the growth the economy would experience if it had zero political capital.

Since these curves measure cumulative democratic experience along the x-axis, they depict the democratization path of a theoretical country from complete autocracy to a developed democracy status. Their conclusions are, in our opinion, both interesting and controversial – society has an economically demanding path to tread in its democratization process. While we did not make any effort to, our results somewhat support the theory that some poor countries may not be

[15] A quite strong assumption, in the author's opinion.

economically ready for democracy – democratization could cripple their economy, possibly to the point where regime reversals could occur.

It should be noted, to finalize, that all we see in the curve is the impact of democratization on growth. It is entirely possible that, at any point, other factors (our controls, for example) offset any growth gains or losses created by the political process. Although we believe this to be a quite important relationship, one should be aware of its *ceteris paribus* environment.

VII. Robustness

Since we have estimated our section VI models with two different democracy measures, we have already performed a significant robustness test to our main results. This section will, as such, serve to perform an estimation that is more in line with the remaining literature – notably, using democracy flows rather than a stock. We have, in section IV, found that the *polity2* variable, as a flow, displays a unit root – due to this and the fact that estimations akin to ours using variables from the Polity IV project abound in the literature, we will use *UDS* for this section[16]. This will both allow us to understand if conclusions change when we swap between formulations and how *UDS* behaves when used as a flow (specifically, if it backs the conclusions the literature has reached using the Polity IV project's variables). It is important to notice, however, that the specifications in this section do not measure the same as those in section VI – while political capital measures the maturity of a country's democracy, the following specifications measure the impact on growth of the level of democracy of the country under analysis at a given year. We have tested both 10-year and 5-year lags[17] of the democracy variable in our specifications, having obtained similar results. Since the latter are slightly more significant and it seems very

[16] Were we to ignore this and use our database to perform this section's estimation with the *polity2* flows, we would find significance for one, two and three inflexion points, all obtaining the inverted-U-shaped curve Barro (1996) and Alfano and Baraldi (2016) estimate.

[17] Murtin and Wacziarg (2014) and Madsen et al. (2015) employ 10-year lags, for example. Coccia (2010) employs 5-year lags, while Krieckhaus (2006) uses both.

reasonable to us that democratization could impact economic growth in five years, we present estimation results for the model with 5-year lagged democracy flows.

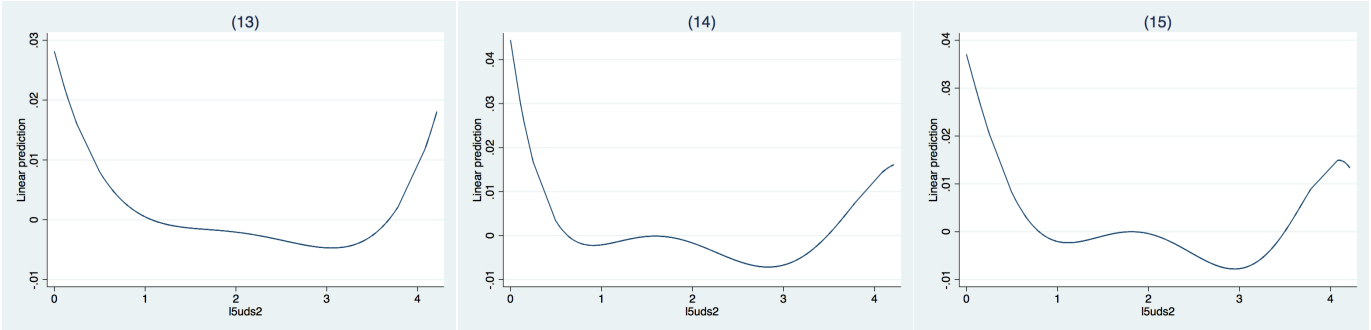
Table 7. Specification tests for *UDS* flows (dependent variable: $GDP\ growth_t$)

Covariates	(11)	(12)	(13)	(14)	(15)
UDS_{t-5}	0.775	2.913	-7.391***	-17.751***	-42.864***
UDS^2_{t-5}	-0.176	-1.151	8.333***	24.140***	77.733***
UDS^3_{t-5}	-	0.132	-3.093***	-12.551***	-58.857***
UDS^4_{t-5}	-	-	0.357***	2.795**	21.972***
$UDS2^5_{t-5}$	-	-	-	-0.225**	-4.015***
UDS^6_{t-5}	-	-	-	-	0.287***
$GDP\ growth_{t-1}$	20.880***	20.897***	20.270***	20.127***	20.036***
$Electric\ consumption_t$	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
$Population\ growth_t$	-0.567**	-0.578**	-0.607**	-0.638**	-0.643**
$Trade\ openness_t$	0.017*	0.017*	0.017*	0.018*	0.016
$Inflation_t$	-0.001*	-0.001*	-0.001*	-0.001*	-0.001

Notes: this table reports estimates of the effect of each independent variable on GDP growth for the Arellano-Bond estimation of each model. Coefficients are multiplied by 100 and rounded to 3 decimal places. All estimations contain a full set of year dummies (omitted in this table). Number of observations: 2243. * denotes significance at a 10% level, ** at a 5% level and *** at a 1% level. Tests for autocorrelation of order 2, 4 and 5 show no evidence of autocorrelation. There is some evidence (not in all specifications) for autocorrelation of order 3 at a 10% confidence level, meaning that our estimated standard errors may be biased downwards. To curb this issue, robust standard errors are employed.

Table 7 is very suggestive of a complex non-linear relationship between democracy flows and future growth – our fully significant specifications (13), (14) and (15) imply 3, 4 or 5 inflexion points, respectively. Figure 3 depicts these three regressions:

Figure 3. Graphical depiction of specifications (13) (left), (14) (center) and (15) (right)



Notes: the y-axis measures the predicted residuals from equation *(II)*, while the x-axis measures the stock of political capital (built with the *UDS* variable).

As figure 3 shows, the three possibilities are, graphically, very similar. It is striking how they differ from the Barro (1996) and Alfano and Baraldi (2016) results – they display a U-shaped curve rather than their inverted U. In terms of implications, they somewhat resemble figures 1 and 2: maximum predicted growth corresponds to the minimum level of democracy. The main

difference here is that now, with curves (13) and (14), from a certain, high-democracy point onwards, democratization does increase growth. On average, the most "growth-unfriendly" points are those in the middle of the spectrum, while very high or very low flows appear to maximize economic growth. In a nutshell, we conclude that zero or close to zero democracy should cause growth (again), and also that a democratic flow needs to be sufficiently high to have the best impact on economic performance.

While it is undeniably true that this curve estimates something different from figures 1 and 2, one conclusion is clearly backed by both sections' estimations – the relationship between economic growth and democracy should not be regarded as linear.

While this section has helped to draw further interesting conclusions, we emphasize that we do not think this kind of specification (the use of democratic flows) is the most adequate to study democracy and growth. In this section, we find that, on average, there is a level of democracy flow that maximizes growth, but if our section VI estimation is to be trusted, this will, for each country, depend on its current democratic position – if it is sufficiently low or past the democracy maximum the flow that maximizes growth should be negative, and if it is sufficiently close to (but before) the democracy maximum it should be positive. This is the reason why we believe that performing this kind of flow analysis for this specific question is not the most correct approach.

VIII. Concluding remarks

Along the course of this paper, we have shown that the relationship between a society's democratization level and its economic growth should be non-linear, meaning that the impact of further democratization on economic performance should vary depending on each country's initial stock of democracy. We provide an in-depth discussion on the concept of democracy stock, its construction and why we believe it to be better suited to analyze this specific question

and those similar. Our conclusions, however, are robust to the use of democracy flow analysis, the approach that the large majority of the literature uses.

Via the use of two different measures of democracy, the widely used *polity2* variable by the Polity IV project and the Unified Democracy Scores by Pemstein et al. (2010), we have further provided insightful comparison between these two measures, creating a new avenue through which we add to the literature. We also coin the term "democracy maximum", which represents the level of democratic development that is enough to classify a country as an evolved democracy and maximizes economic growth. Finally, we add some weight to the argument that autocracies may maximize growth by finding that our maximum estimated economic growth occurs with zero political capital.

Our work leaves, in our view, several open paths for improvement and further investigation, notably the use of a larger timeframe (especially for the accumulation of the political stock) and a more balanced panel, more sophisticated econometric techniques and alternative political capital formulations. The crossing of these results with a measure of general population welfare, so as to measure the net gains from democratization (economic versus social, potentially) could also yield an interesting further research question. Finally, democracy stock and flow analysis could be combined in a single regression framework to evaluate the impact of flows when controlling for previous democratic experience.

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Appendix

A1. Included countries and their respective *polity2* and *UDS* scores, 1960 and 2010

	1960		2010	
Country	***polity2***	***UDS***	***polity2***	***UDS***
Albania	-9	-1.16	9	0.47
Argentina	-1	0.05	8	0.66
Australia	10	1.19	10	2.25
Austria	10	1.31	10	1.69
Belgium	10	1.3	8	1.35
Bolivia	-3	-0.01	7	0.32
Brazil	6	0.44	8	0.92
Bulgaria	-7	-0.98	9	0.81
Cameroon	-6	-0.21	-4	-0.49
Canada	10	1.08	10	1.77
Sri Lanka	7	0.69	4	0.24
Chile	5	0.48	10	1.18
China	-8	-1.08	-7	-0.77
Colombia	7	0.21	7	0.34
Congo, DRC	0	-0.44	5	-0.43
Costa Rica	10	0.96	10	1.41
Denmark	10	1.31	10	2.23
Dominican Republic	-9	-1.17	8	0.61
Ecuador	2	0.33	5	0.3
Finland	10	1.3	10	2.24
France	5	0.45	9	1.09
Ghana	-8	-0.77	8	0.67
Greece	4	0.36	10	1.26
Guatemala	-5	-0.23	8	0.38
Hungary	-7	-0.97	10	1.18
India	9	0.84	9	0.83
Ireland	10	1.09	10	1.48
Israel	10	1.18	10	1.17
Italy	10	1.59	10	1.17
Cote d'Ivoire	-9	-0.91	0	-0.47
Jamaica	10	1.45	9	0.74
Japan	10	1.2	10	1.38
Jordan	-9	-1.08	-3	-0.51
South Korea	8	0.21	8	1.07
Madagascar	-1	0.14	0	-0.39
Malaysia	10	0.44	6	0.35
Mali	-7	-0.67	7	0.42
Mexico	-6	-0.3	8	0.56
Morocco	-5	-0.76	-6	-0.47
Oman	-10	-1.87	-8	-0.9
Netherlands	10	1.53	10	1.7
New Zealand	10	1.18	10	1.88
Niger	-7	-0.67	3	-0.29
Nigeria	8	0.41	4	-0.15
Norway	10	1.18	10	2.26
Pakistan	-7	-1.14	6	0.02
Peru	5	0.11	9	0.66
Philippines	5	0.48	8	0.56
Poland	-7	-0.98	10	1.18
Portugal	-9	-1	10	1.48
Romania	-7	-0.98	9	0.71
Saudi Arabia	-10	-1.62	10	-1.5
Senegal	-1	-0.32	7	0.28
South Africa	4	-0.24	9	0.8
Spain	-7	-1.2	10	1.55
Sweden	10	1.18	10	2.25
Switzerland	10	1.09	10	2.26
Thailand	-7	-0.98	4	0.2
Tunisia	-9	-0.62	-4	-0.64
Turkey	7	-0.39	7	0.33
Egypt	-7	-0.8	-3	-0.51
United Kingdom	10	1.18	10	1.56
United States	10	1.08	10	1.56
Burkina Faso	-7	-1	0	-0.29
Uruguay	8	0.85	10	1.56
Venezuela	6	0.54	-3	-0.04

A2. Tables 5 and 6: graphical depictions of specifications (1) to (10)

Notes: the y-axis measures the predicted residuals from equation *(II)*, while the x-axis measures the stock of political capital (*polity2* for the left-hand-side graphs and *UDS* for the right-hand-side ones).